Vacuum treatment of open-hearth furnace... S/133/61/000/004/015/015
A054/A127

ings made from vacuumized ShKh15 steel increases by 70%. Rejects of the steel grade 38XM,OA (38KhMYuA) due to surface rejects could be reduced from 14.0 to 6.45% by vacuum treatment of the steel in the ladle. No flake formation could be noticed in 37XC (37KhS) steel, which also was vacuum-treated. At the Chelyabinskiy metallurgicheskiy zavod (Chelyabinsk Metallurgical Plant), vacuumized siphon pouring was applied in the casting of steel ingots of the 18XHBA (18KhNVA) steel grade, weighing 1,15 kg. Improved macrostructure and reduced reject rates due to intercrystalline cracks have been achieved.

Card 2/2

DENISOV, K.N., kand.tekhn.nauk; D'YAKONOV, V.D., kand.geogr. nauk

Machine algorithms for the calculation of equatorial coordinates of sun and stars on electronic digital computers used in navigation. Trudy TSNIIMF 8 no.47:74-81 '63. (MIRA 16:12)

D'YAKONOV, V.I., student; TSFAS,B.S., dotsent, nauchnyy rukovoditel' raboty

Theory of a rural lever-type well. Sbor.dokl.Stud.nauch.ob-va Fak.mekh.sel'.Kuib.sel'khoz.inst.no. 1:42-44 '62. (MIRA 17:5)

1. Kuybyshevskiy sel'skokhozyaystvennyy institut.

PETROV, Kuart Mikhaylovich, nauchn. sotr.; D'YAKONOV, Vasiliy Ivanovich, nauchn. sotr.; DAVYDOVA, I., red.

[Vacuum is a magician] Vakuum - volshebnik. Sverdlovsk, Sverdlovskoe knizhnoe izd-vo, 1963. 137 p. (MIRA 17:8)

1. Ural'skiy nauchno-issledovatel'skiy institut chernykh metallov (for Petrov, D'yakonov).

D'YAKONOV, V.I.; POPEL', S.I.

Nonmetallic inclusions in vacuum-smelted ball-bearing steel during various methods of introducing chromium. Izv. vys. ucheb. zav.; chern. met. 7 no.10:17-21 '64.
(MIRA 17:11)

1. Ural'skiy politekhnicheskiy institut i Ural'skiy institut chernykh metallov.

D'YAKONOV, V., inzh.

Trigger pulse generator. Radio no.10:56-57 O '65.
(MIRA 18:12)

D'YAKONOV, V., Mat. Gen., TURKIN, P., Eng. Col., NIKIFOROV, N., Col, and STOLBOSHINSKIY, A. Col.

Authors of the book "Kurs Artillerii" (Artillery Course)

SO: N: Krasna Zvezda, No 96(7931)

Abstract in USAF "Treasure Island", on file in Library of Congress, Air Information Division, Report No 91260.

1. D'YAKONOV, V.[F.]

2. USSR (600)

4. Nautical Astronomy

7. Calculation of local time angles of a heavenly body in determining a location from several near meridian altitudes., Mor. flot, 12, No. 12, 1952.

9. Monthly List of Russian Accessions, Library of Congress, February 1953. Unclassified.

D'YAKONOV, V. F.

"Influence of Computational Errors of Computed Heights on the L cation of the Ship To Be Determined From the Method of Position Lines"
Uch. zap. Vyssh. ankt. mor. uchilishcha, No 4, 1953, 47-67

Analysis of the height value, computed from approximate coordinates of the ship, leads to conclusion that the table No 27 of the new edition of Navigational Tables (MT-43) is the Most convenient and accurate. A polemic with P. F. Skorodumov is added, dealing with his work "The Choice of Number of Places of Logarithmic Tables' Used for Computation of Heights of Celestial Bodies," in which he advises five-place logarithms for the said computation, while the author considers four-place logarithms sufficient. (RZhAstr, No 10, 1955)

SO: Sum-No. 787, 12 Jan 56

D'YAKONOV, V.F., dotsent.

Sextant with optical reading and star finder (from "Ezhemesiachnyi zhurnal tochnoi mekhaniki i optiki" no.2, 1954) (MIRA 10:11)

1. Kafedra morekhodnoy astronomii Leningradskogo Vysshego inzhenernogo morskogo uchilishcha.
(Germany, East--Nautical instruments)

D'YAKONOV, V.K.; DOROSHENKO, N.L.; KOMPANEYETS, A.A.; TSARENKO, A.P., redaktor; VERINA, G.P., tekhnicheskiy redaktor.

[Organizing the work of locomotive crews using job designation time schedules on the Southwestern Railroad Line] Opyt organizatsii raboty lokomotivnykh brigad po imennym raspisaniiam na IUgo-Zapadnoi doroge. Moskva, Gos. transp. zhel-dor. izd-vo, 1954. 75 p. (MLRA 7:12)
(Railroads--Train dispatching) (Locomotives)

D'YAKONOV, V.F.; KULIKOV, D.K., redaktor; VOLCHOK, K.M., tekhnicheskiy redaktor

[Determining ship's position by the sun; with an investigation of accuracy] Opredelenie mesta sudna po solntsu; s issledovaniem tochnosti. Leningrad, Gos. izd-vo vodnogo transporta, Leningradskoe otd-nie, 1954. 173 p. (MLRA 7:10)
(Navigation)

D'YAKONOV, V., dotsent.

New dometic instruments for precise time-keeping. Mor.flot 15 no.4: 8-10 Ap '55. (MLRA 8:5)
(Chronometer)

D'YAKONOV, V.F

BASHTANNIK, Kirill Georgiyevich [deceased]; D'YAKONOV, V.F., nauchnyy redaktor; SAVCHENKO, K.N., nauchnyy redaktor; IVANOV, K.A., redaktor izdatel'stva; TIKHONOVA, Ye.A., tekhnicheskiy redaktor

[Nautical astronomy] Morekhodnaia astronomiia. Moskva, Izd-vo "Morskoi transport," 1956. 318 p. (MLRA 10:4)
(Nautical astronomy)

D'YAKONOV, V.F.

RACHKOV, Anatoliy Antonovich; D'YAKONOV, V.F., otvetstvennyy red.; KUZNETSOV, A.D., red.; DROZHZHINA, L.P., tekhn.red.

[Principles of nautical astronomy] Osnovy morekhodnoi astronomii. Izd.2-oe, perer.i dop. Leningrad, Izd-vo "Morskoi transport," 1957. 313 p. (MIRA 11:1)
(Nautical astronomy)

AUTHOR: Dyakonov, V.F. 33-3-23/32

TITLE: The effect of diurnal aberration on the accuracy of determining latitude from observations of Polaris.(O vliyanii sutochnoy aberratsii na tochnost' opredeleniya shiroty mesta po polyarnoy zvevde)

PERIODICAL: "Astronomicheskiy Zhurnal" (Journal of Astronomy), 1957, Vol.34, No.3, pp. 484-487 (U.S.S.R.)

ABSTRACT: An analysis is made of the effect of diurnal aberration on the equatorial co-ordinates (α, δ) of Polaris and on the accuracy of determinations of latitude of astronomical positions of class II from observations of Polaris. This is contrary to the view of A.V. Butkevich, who expressed the opinion that this is not necessary.

On the basis of the analysis, and numerical tables, the author has shown that the effect of diurnal aberration can cause a total error of the order of 0.5" in the latitude (with $t < 90^{o}$). It is therefore recommended that the effect of diurnal aberration should always be taken into account when determinations of the geographic latitude from the observations on Polaris are carried out. There are 4 tables and 4 references, all of which are Slavic.

Card 1/1

SUBMITTED: July 20, 1956.
AVAILABLE: Library of Congress

APPROVED FOR RELEASE: 08/22/2000 CIA-RDP86-00513R000411720004-2"

D'YAKONOV, V., dots.

Limits for replacing the parallel of an observed latitude and the meridian of an observed longitude by the celestial line of position. Mor. flot 18 no.1:4-5 Ja '58. (MIRA 11:1)

1. Kafedra morekhodnoy astronomii Leningradskogo Vysshego inzhenernogo morskogo uchilishcha.

(Nautical astronomy)

D'YAKONOV, Vasiliy Fomich; KUZNETSOV, A.D., red.; DROZHZHINA, L.P., tekhn. red.

[Determining a ship's position by the sun with a check for accuracy] Opredelenie mesta sudna po solntsu s issledovaniem tochnosti. Leningrad, Izd-vo "Morskoi transport," 1958. 238 p. (MIRA 11:7)
(Navigation) (Nautical astronomy)

20(1,5) PHASE I BOOK EXPLOITATION SOV/2016

D'yakonov, Vasiliy Fomich

Morekhodnaya astronomiya (Nautical Astronomy) Leningrad, Izd-vo "Morskoy transport," 1958. 462 p. 8,000 copies printed. Errata slip inserted.

Specialist Ed.: A.F. Matsyuto; Ed. of Publishing House: Z.S. Frishman, Tech. Ed.: O.I. Kotlyakova.

PURPOSE: This textbook on nautical astronomy is intended for students of navigation at the intermediate level of naval schools. It is approved as such by the MMF (Ministry of the Navy). It may also serve as a practical manual for navigators of the transport and fishing fleets.

COVERAGE: This book on general nautical navigation is divided into three sections. Section I contains information from plane trigonometry and spherical trigonometry pertinent to the science of navigation. Section II deals with the fundamentals of spherical astronomy as well as information on the theory of errors. Section III confines itself to two problems: determining the position of a ship and compass corrections based on the observation of celestial bodies. All sections

Card 1/14

contain test problems to be solved by reference to the 1957 Nautical Astronomical Almanac. The author thanks navigation-engineers I.I. Katin, G.O. Mitsevich, L.S. Golubov, and A.F. Matsyuto for their help. There are 72 Soviet references.

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8-11-59

D'YAKONOV, V. F., dots.

Pocket sextant. Mor.flot 19 no.1:44-45 Ja '59. (MIRA 12:3)

1. Kafedra morekhodnoy astronomii Leningradskogo vysshego inzhenernogo morskogo uchilishcha im. admirala Makarova.
(Sextant)

D'YAKONOV, V., dotsent

Yugoslave tables of altitude and azimuth of celestial bodies. Mor.flot. 20 no.8:42-43 Ag '60. (MIRA 13:8)

1. Leningradskoye vysshaye inzhenernoye morskoye uchilishche im. admirala Makarova.
(Yugoslavia--Nautical astronomy)

D'YAKONOV, V.F., dotsent

Devices for direct determination of the latitude and longitude of the observer. Biul.tekh.-ekon.inform.Tekh.upr.Min.mor.flota 5 no.4: 79-86 '60. (MIRA 15:1)

1. Leningradskoye vyssheye inzhenernoye morskoye uchilishche im. admirala Makarova.

(Nautical astronomy)

D'YAKONOV, V.F., dotsent, kand.geograf.nauk

Direct computation of geographical coordinates of the position of a ship by the observation of two stars. Sudovozhdenie no.2:19-26 '62. (MIRA 17:4)

1. Kafedra astronomii Leningradskogo vysshego inzhenernogo morskogo uchilishcha im. admirala Makarova.

D'YAKONOV, V.F.

Precomputation of local hour angles and the inclination of the sun and stars for any moment of the day during the current year. Inform. sbor. TSNIIMF no.74: Sudovozh. i sviaz' no.19: 52-71 '62. (MIRA 16:6)

(Nautical astronomy)

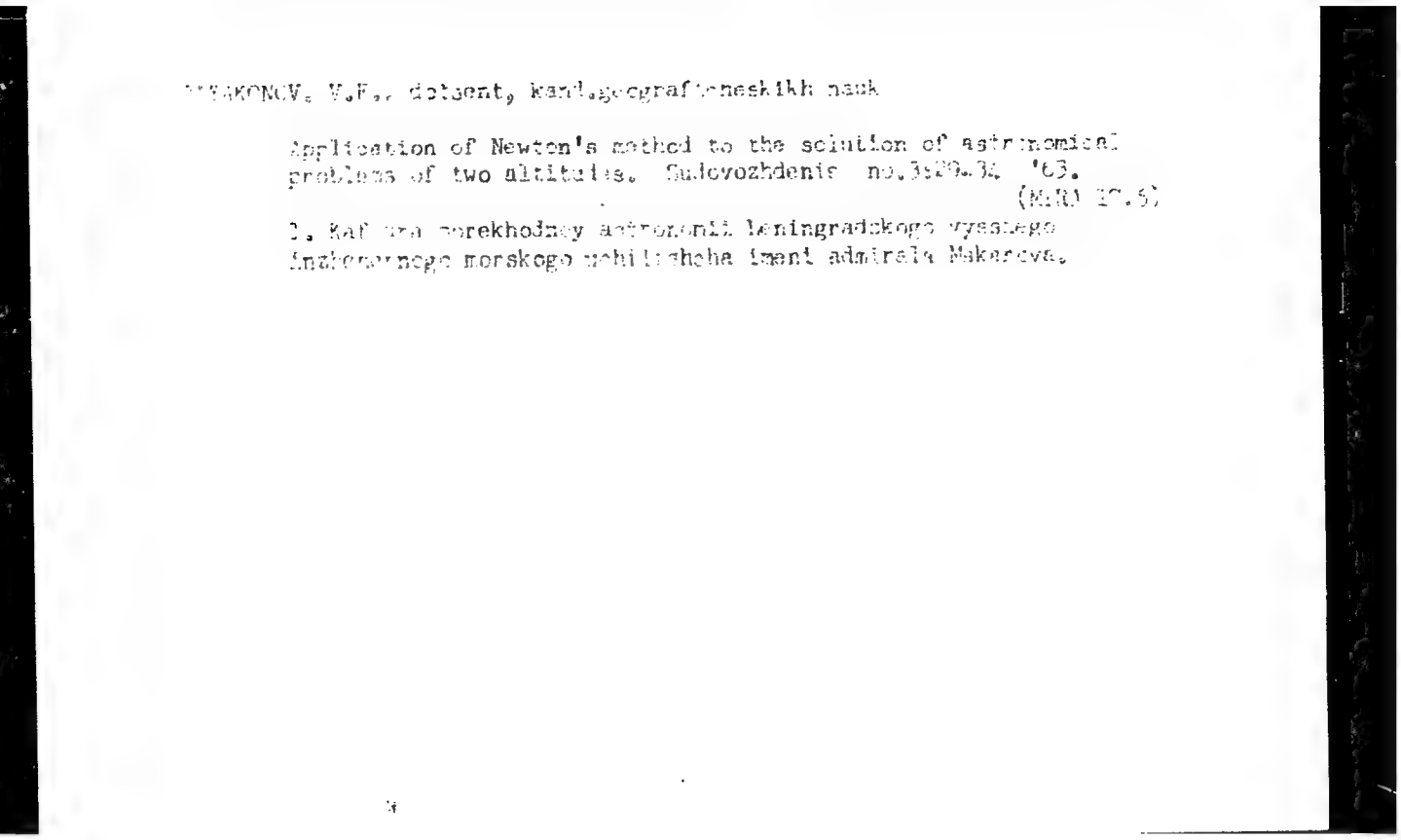
GOLUBEV, Genrikh Aleksandrovich; D'YAKONOV, Vasiliy Fomich; KRASAVTSEV, Boris Ivanovich; MURMANSKIY, Feliks Nikolayevich; NASTAY, Napoleon Napoleonovich; YERMAKOV, I.G., kand. fiz.-matem.nauk, retsenzent; ZHEREBTSOV, M.N., prepodavatel', retsenzent; RYBALTOVSKIY, N.Yu., prof., red.; FRISHMAN, Z.S., red.izd-va; STUL'CHIKOVA, N.P., tekhn. red.

[Problems in nautical astronomy] Zadachnik po morekhodnoi astronomii. Leningrad, Izd-vo "Morskoi transport," 1963. 287 p. (MIRA 17:3)

1. Arkhangel'skoye morekhodnoye uchilishche (for Zherebtsov).

D'YAKONOV, Vasiliy Fomich; MATSYUTO, A.F., kapitan dal'nego plavaniya, red.

[Nautical astronomy] Morekhodnaia astronomiia. Izd.2., perer. i dop. Leningrad, Izd-vo "Morskoi transport," 1963. 587 p. (MIRA 17:4)



TAKONOV, V.F., dotsent, kand.geograficheskikh nauk

Application of Newton's method to the solution of astronomical problems of two altitudes. Sudovozhdenie no.3:29-34 '63. (MIRA 17:5)

1. Kafedra poverkhnostnoy astronomii Leningradskogo vysshego inzhenernogo morskogo uchilishcha imeni admirala Makarova.

D'YAKONOV, V.F., dotsent, inzhener-kapitan zapasa

How to use the M.A.E. [marine astronomical yearbook] interpolation tables in calculating hour angles and the declination of celestial bodies. Mor.sbor. 46 no.5:58-60 My '63. (MIRA 16:4)
(Nautical astronomy)

D'YAKONOV, V.F., dotsent, kand. geograf. nauk

Determining the time of the sun's (earth's) passage through the perigee (perihelion) for the [illegible] equator coordinates of celestial [illegible] moment of a day of the current year with [illegible] astronomy problems. Sudovozhdenie [illegible].

(MIRA 18:1)

1. Kafedra morekhodnoy astronomii Leningradskogo vysshego inzhenernogo morskogo uchilishcha imeni admirala Makarova.

ACC NR: AT6029318 SOURCE CODE: UR/0000/66/000/000/0213/0220

AUTHOR: D'yakonov, V. G.; Usmanov, A. G.

ORG: none

TITLE: Boiling heat transfer on a surface with direct high frequency heating

SOURCE: Moscow. Energeticheskiy institut. Teploobmen v elementakh energeticheskikh ustanovok (Heat exchange in power installation units). Moscow, Izd-vo Nauka, 1966, 213-220

TOPIC TAGS: turbulent heat transfer, heat transfer coefficient, alternating electromagnetic field

ABSTRACT: With the application of conventional heating methods (direct current, alternating 50 cycle current, steam heating) the temperature of the outside surface of the tube, which is necessary for calculation of the heat transfer coefficient, is calculated by the equations:

$$t_{\text{ж cut}} = t_{\text{ж in}} + 0; \quad (1)$$

$$0 = \frac{q d_{\text{ж}}}{4\lambda}\left[1 - \frac{2\ln\frac{d_{\text{ж}}}{d_{\text{ж}}}\text{out}}{\left(\frac{d_{\text{ж}}}{d_{\text{ж}}}\right)^2_{\text{in}} - 1}\right]. \quad (2)$$

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ACC NR: AT6029318

Here, t_{in} is the temperature of the inner surface; t_{out} is the temperature of the outer surface; θ is the temperature difference between the inner and outer surfaces; q is the specific heat flux; λ is the heat conductivity of the flow; d_{out} and d_{in} are the outside and inside diameters of the tube. However, calculation of the value of ζ by Equation (2) leads to a large error, in some cases up to 17.5%. This leads to an error in the calculation of the heat transfer coefficient

$$\alpha = \frac{q}{\Delta t} = \frac{q}{t_{out} - t_{in}}. \qquad (3)$$

With the aim of reducing these errors, experiments were carried out using a high frequency generator, Type GL-15, with a vibrational power of 8.5 kilowatts, and a working frequency of 650 kilocycles. Tests were made with a variety of liquids: benzene, ethanol, methanol, carbon tetrachloride, acetone, and double-distilled water. Detailed results are given in tabular form. The results demonstrate the effect of a rapidly alternating electromagnetic field on the intensity of heat transfer in the boiling of various liquids. It can be assumed that this effect can be explained by the interaction of the molecules of the boiling liquid with the high frequency electromagnetic field, leading to an increase in the number of active vapor formation centers. Orig. art. has: 10 formulas, 3 figures and 2 tables.

SUB CODE: 20/ SUBM DATE: 05Apr66/ ORIG REF: 004/ OTH REF: 001

Card 2/2

S/137/60/000/012/001/041
A006/A001

Translation from: Referativnyy zhurnal, Metallurgiya, 1960, No. 12, p. 60, # 28441

AUTHORS: D'yakonov, V.I., Petrov, K.M.

TITLE: Vacuum Treatment of Structural Steels

PERIODICAL: Byul. nauchno tekhn. inform. Ural'skiy n.-i. in-t chern. metallov, 1959, No. 7, pp. 8 - 14

TEXT: The 38ХМЮА(38KhMYuA), 12Х2Н4А (12Kh2N4A), ШХ15 (ShKh15) and band steels were subjected to vacuum treatment. Seven heats were produced in a 250-kg furnace and the same number in a 130-kg induction furnace. Heats of the first group were vacuum treated during syphon-teeming process, heats of the second group were treated in the ladle prior to teeming. The teeming temperature was 1,600 - 1,610°C. Vacuum treatment in the ladle was performed for 15 - 30 minutes at a residual pressure as high as 15 - 30 mm Hg. The mechanical properties of Cr-Ni steel were not improved. Only a slight increase in a_k of

Card 1/2

Vacuum Treatment of Structural Steels

S/137/60/000/012/001/041
A006/A001

12Kh2N4A and band steel was observed. The content of non-metallic impurities decreased only in band and ball-bearing steel. In all steels [H] decreased by about 1 - 1.5 $cm^3/100$ g, and [N] remained unchanged. The macro and microstructure were satisfactory.

Ye.K.

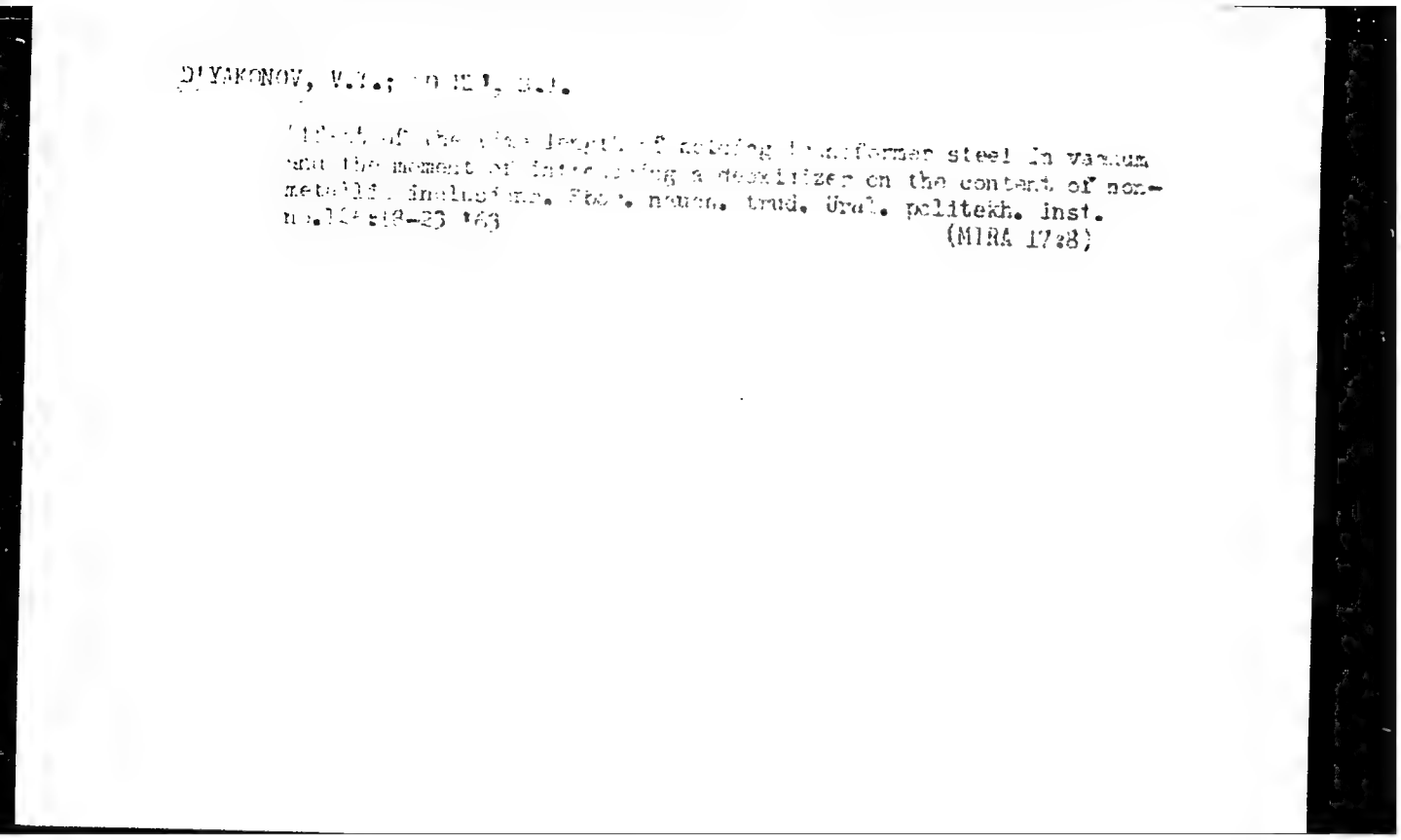
Translator's note: This is the full translation of the original Russian abstract.

Card 2/2

PETROV, K.M.; DYAKONOV, V.I.; FADEYEV, I.G.; SEMENENKO, P.P.; KRYUKOV, L.G.; Prinimali uchastiye: PASTUKHOV, A.I.; SHISHKINA, N.I.; PAZDNIKOVA, T.S.; CHIRKOVA, S.N.; KAREL'SKAYA, T.A.,; LOPTEV, A.A.; DZEMYAN, S.K.; ISUPOV, V.F.; BELYAKOV, A.I.; GUDOV, V.I.; SUKHMAN, L.Ya.; SLESAREV, S.G.; GOLOVANOV, M.M.; GLAGOLENKO, V.V.; ISUPOVA, T.A.; ZYABLITSEVA, M.A.; KAMENSKAYA, G.A.; POMUKHIN, M.G.; UTKINA, V.A.; MANEVICH, L.G.

Vacuum treatment of alloyed open hearth steel. Stal' 22 no.2:113-117 F '62. (MIRA 15:2)

1. Ural'skiy nauchno-issledovatel'skiy institut chernykh metallov (for Pastukhov, Shishkina, Pazdnikova, Chirkova, Karel'skaya, Loptev, Dzemyan). 2. Metallurgicheskiy kombinat im. A.K. Serova (for Isupov, Belyakov, Gudov, Sukhman, Slesarev, Golovanov, Glagolenko, Isupova, Zyablitseva, Kamenskaya). 3. 6-y Gosudarstvennyy podshipnikovyy zavod (for Pomukhin, Utkina, Manevich).
(Steel--Metallurgy)
(Vacuum metallurgy)



D'YAKONOV, V.Y.; [illegible], S.I.

Effect of the time length of holding transformer steel in vacuum and the moment of introducing a deoxidizer on the content of nonmetallic inclusions. Sb. nauch. trud. Ural. politekh. inst. no.134:19-23 '63 (MIRA 17:8)

L 39764-65 EWT(m)/EWA(d)/EWP(t)/EWP(z)/EWP(b) IJP(c) JD/JG

ACCESSION NR: AP4047334 S/0148/64/000/010/0017/0021

AUTHOR: D'yakonov, V. I.; Popel', S. I.

TITLE: Nonmetallic inclusions in vacuumed ball-bearing steel with different methods of chromium alloying

SOURCE: IVUZ. Chernaya metallurgiya, no. 10, 1964, 17-21

TOPIC TAGS: vacuum treatment, nonmetallic inclusion, carbon steel, chromium additive, quartz, tungsten additive, ball bearing steel, chromium alloying

ABSTRACT: Vacuum treatment of ball-bearing steel greatly improves quality but the problem of lowering the number of inclusions has been inadequately studied. Therefore, the authors undertook a study of the effects of vacuum refining carbon steel on inclusions and on their composition by using the method of Cr inoculation. The charge was composed of 150 g sponge iron with 0.05% C, 0.007% Si, 0.006% Mn, 0.005% S and 0.008% P, and 5 g crushed electrode. Metallic chromium (99.5% Cr) was added in batches of 0.5, 1 and 1.5%. Specimens were treated in a

Card 1/2

L 39764-65

ACCESSION NR: AP4047334

3

high-frequency vacuum furnace at 1585 C. After the completion of boiling Cr was introduced and the specimens subjected to furnace cooling. The second method consisting in charging Cr together with the iron into a cold furnace produced 50% less inclusions in the degassed Cr specimens. The content of wustite was 6-7%, quartz 53% and chromite and chromium oxide 60% lower. Cr added to degassed metal produced 0.050 to 0.082% (weight of steel) oxides. An increase in the amount of Cr did not change the number of inclusions. Orig. art. has: 3 tables.

ASSOCIATION: Ural'skiy politekhnicheskiy institut (Urals Polytechnic Institute); Ural'skiy institut chernykh metallov (Urals Institute of Ferrous Metals)

SUBMITTED: 01Apr63 ENCL: 00 SUB CODE: MM

NR REF SOV: 012 OTHER: 001

pure metal (Cr) 18

Card 2/2 (pm)

FREYDIN, L.M.; GRITSENKO, M.I.; PETROV, K.M., inzh.; D'YAKONOV, V.I., inzh.

New developments in research. Stal' 24 no.7:596 Jl '64.
(MIRA 18:1)

VLASOV, N.P.; D'YAKONOV, V.I.

Chromium reduction from chromium-containing furnace patching materials. Ogneupory 30 no.10:21-23 '65. (MIRA 18:10)

1. Ural'skiy nauchno-issledovatel'skiy institut chernykh metallov.

D'YAKONOV, V.K., polkovnik meditsinskoy sluzhby; ROMASH, V.M., podpolkovnik meditsinskoy sluzhby; BYKHALOV, L.P., mayor meditsinskoy sluzhby

Biomycin in treating pustular diseases of the skin; abstract. (MIRA 14:7)
Voen.-med.zhur. no.3:77-78 Mr '61.
(SKIN--DISEASES) (AUREOMYCIN)

D'YAKONOV, V.K.

KRIVONOS, Petr Fedorovich; D'YAKONOV, V.K., red.; POLOTAY, A.M., red.

[Railroad transportation as an important branch of the national economy of the Soviet Union; on the All-Union Railroad Worker's Day] Zheleznodorozhnyi transport kak vazhneishaia otrasl' narodnogo khoziaistva Soiuza SSR (ko Vsesoiuznomu dniu zheleznodorozhnika). Kiev, Ob-vo po rasprostraneniiu polit. i nauchnykh znanii USSR, 1957. 13 p. (MIRA 11:2)
(Railroads)

D'YAKONOV, V.K

IGNAT'EV, Aleksandr Fedorovich; D'YAKONOV, V.K., otvetstvennyy red.; TSYPLAKOV, N.V., otvetstvennyy red.

[New types of cars for Soviet railroads] Novye tipy vagonov na zheleznykh dorogakh SSSR. Kiev, 1957. 38 p. (MIRA 11:4)
(Railroads--Cars)

D'YAKONOV, V. K.

LOGVINENKO, Ivan Petrovich [Lohvynenko, I.P.]; GORILOVSKIY, Mikhail Iosifovich [Horilovs'kyi, M.I.]; D'YAKONOV, V.K., red.; LISENKO, F.K. [Lysenko, F.K.], red.

[Electrification of Ukrainian railroads] Elektryfikatsiia zaliznyts' Ukrainy. Kyiv, 1958. 35 p. (Tovarystvo dlia poshyrennia politychnykh i naukovykh znan' Ukrains'koi RSR. Ser. 4, no.1) [In Ukrainian] (MIRA 11:6)

(Ukraine--Railroads--Electrification)

MONAKHOV, K.K.; D'YAKONOV, V.L.

Electrodes for multichannel registration of biocurrents of the brain. Zhur.nevr. i psikh. 59 no.8:1010-1014 '59. (MIRA 12:12)

1. Laboratoriya elektroentsefalografii (zav. - prof. M.N. Livanov) Instituta vysshey nervnoy deyatel'nosti AN SSSR i kafedra psikhiatrii (zav. - prof. A.V. Snezhnevskiy) TSentral'nogo instituta usovershenstvovaniya vrachey, Moskva.
(BRAIN physiol.)

L 38552-65

ACCESSION NR: AP5005401 S/0239/65/051/002/0278/0280

[illegible]elekhova, A. M.; D'yakonov, V. L.

[illegible] simple micromanipulator for inserting electrodes into the [illegible]

[illegible]fiziologicheskiy zhurnal SSSR, v. 51, n. [illegible], [illegible], 278-280

[illegible]animal, brain, nerve cell, micromanipulator, [illegible], electrode holder

[illegible] A simple miniature micromanipulator has been developed [illegible] registering single nerve cell activity in an animal [illegible] microelectrodes in such a way that [illegible] the cell and at the same time [illegible] micromanipulator (50 gm wt., [illegible] body of a frame, a screw screw, [illegible] a holder, and a dial [illegible] screws. The parts are made [illegible] micromanipulator is secure[illegible] movement and can be used with one or more [illegible]

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ACCESSION NR: AP5005401

...either case all electrodes must be inserted at the same time until a ... is perfected. The electrode is held in place at any given ... the electrode holder rod with adjustable screws or ... The ...ulator has proven convenient and simple to use in ... on rabbits. A detailed description of ... is ... art. has: 3 figures.

ASSOCIATION: Laboratoriya elektrofiziologii Instituta vysshey nervnoy deyatel'nosti i neyrofiziologii AN SSSR, Moscow (Electrophysiology Laboratory of the Institute of Higher Nervous Activity and Neurophysiology AN SSSR)

SUBMITTED: 30Sep63 ENCL: 00 SUB CODE: LS

NR REF SOV: 001 OTHER: 006

Card 2/2

D'YAKONOV, V. M.

Mbr., ZIS (-1945-)

"A Machine Tool for Slotting Shavers," Stanki i Instrument, 16, Nos. 10-11, 1945

ER-52059019

D'YAKONOV, V. M.

Siukeevskie caverns. Prioroda 41, № 6, 1952.

D'YAKONOV, V. N.

V. N. D'yakonov, and N. I. Kurnakov, Kaktusy i ikh kul'tura v komnatnykh usloviyakh (Cactuses, and Their Cultivation Indoors) (From the series "V pomoshch' lyubitelyam kul'tury rasteniy" (In Aid to Plant-Growing Hobbyists) Leningrad University Press.

The booklet gives a description of the significance of cactuses as decorative and cultural plants, and includes a brief sketch of the geographical distribution of cactuses and a classification of the principal groups and genera of the cactus families.

The booklet is intended for gardening hobbyists.

SO: Sovetskiye knigi (Soviet Books), No. 136, 1953, Moscow, (U-[illegible])

AUTHOR: D'yakonov, V.M., Engineer SOV-117-58-4-4/21

TITLE: The Manufacture of Cutting Tools (Izgotovleniye rezhushchego instrumenta)

PERIODICAL: Mashinostroitel', 1958, Nr 4, pp 12-17 (USSR)

ABSTRACT: The tool shop of the Automobile Plant imeni I.A. Likhachev produces 80% of the Plant's requirements for cutting tools. The article presents the following information on the work methods, technology and devices being used at present in this tool shop: a special cutting stamp (Figure 1) for cutting tool blanks; the new shape of carbide tool ends (Figure 2) and the technology of attaching the carbide tips; new thin carbide tips (Table 3), etc. Modernization of the vertical milling machines of the shop is described in general terms. A special high-efficiency grinding machine for relieving multiple hobs, designed at the tool shop, is described and illustrated by diagram. This grinder differs from the conventional relieving grinders by the absence of the lead screw. The spindle is moved in axial direction by a cam. There is almost no wear in comparison with that of the lead screws. A particular feature of the grinder is that it reduces the accumulated pitch error, which could not be achieved in any other known machine design. There are 7 diagrams and

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The Manufacture of Cutting Tools

and 5 tables.

1. Cutting tools---Production

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D'YAKONOV V.N.

TIKHONOV, A.N.; IVANOV, A.G.; TROYTSKAYA, V.A.; D'YAKONOV, V.N.

On the relation of terrestrial currents and earthquakes.
Trudy Geof.inst. no.25:181-191 '54. (MLRA 7:12)
(Seismology) (Magnetism, Terrestrial)

DIYAKONOV, V.N., Cand Tech Sci -- (diss) "Study of stresses in links of link gears with clearances in ball-and-socket joints ~~with the objective~~ of increasing the reliability of its operation." Mos, 1958, 19 pp with ~~sketches~~ (Min of Railways USSR. Mos Order of Lenin and Order of Labor Red Banner Inst of Engineers of Railroad Transport im I.V. Stalin) 150 copies (KL, 27-58, 109)

BAULIN, I.S., inzh.; D'YAKONOV, V.N., kand.tekhn.nauk.; USKOVA, O.N., kand. tekhn.nauk.; SHUR, Ye.A., inzh.; KONYYKHOV, A.D., inzh.; AFANAS'YEV, L.U., inzh.; EVLIKANOV, A.V., inzh.

Investigating the mechanism of rail contact-fatigue damages (defects 82 and 64). Vest.TSNII MPS 21 no.4:27-30 '62. (MIRA 15:6)
(Railroads--Rails--Defects)

D'YAKONOV, V.N., kand.tekhn.nauk; RUBIN, G.V., kand.tekhn.nauk; KISEL'NIKOVA, O.V., kand.tekhn.nauk

Electric furnace bath for isothermal hardening. Trudy MIIT no.160:27-30 '62. (MIRA 16:2)
(Furnaces, Heat treating)

KONYUKHOV, A.D.; D'YAKONOV, V.N.

Testing the bearing strength of a rail steel under repeated impact stress. Zav.lab. 29 no.8:984-986 '63. (MIRA 16:9)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut zheleznodorozhnogo transporta.
(Steel—Testing)

D'YAKONOV, V.N., kand. tekhn. nauk; KOLOTUSHKIN, S.A., inzh.

Ultrasonic testing of rails removed from the track. Put' i put. khoz. 8 no.9:32-33 '64. (MIRA 17:11)

BAULIN, I.S., inzh.; D'YAKONOV, V.N., kand.tekhn.nauk

Improving the quality of standard make rails manufactured from Martin steel. Trudy TSNII MPS no.292:166-183 '65.
(MIRA 18:10)

DYAKONOV, V.P.

Evaluating the effects of dissolved gases on the compressibility factor of reservoir waters as exemplified by fields of the Saratov and Volgograd regions. Nauch.-tekh. sbor. po dob. nefti. no.20:12-17 '63. (MIRA 17:6)

S/128/61/000/001/004/009
A054/A133

AUTHORS: Kletskin, G. I.; Sobol', N. L.; D'yakonov, V. Ye.; Rabinovich, V. D., and Yan Zhu-Yao

TITLE: Study of processes in cupola furnaces in which part of the coke is replaced by natural gas

PERIODICAL: Liteynoye proizvodstvo, no. 1, 1961, 19-25

TEXT: Although several Soviet plants use natural gas for firing furnaces, there is still a number of problems connected with the replacement of coke by gas. In cooperation with the Mosgazoproyekt Institute the Stankolit Plant put a coke-gas fired 10 - 12 t/h capacity cupola furnace into service last year, which is equipped for tests. As to the design of gas-fired furnaces, the general opinion is that when fired only by natural gas, the cupola design must be changed radically and should be given a shape resembling a shaft or air furnace. When both coke and gas are applied, however, its design has to undergo only slight modifications and, if necessary, the furnace can be fired by coke only. Special features of the furnace converted for coke and gas firing (Fig. 1) are the two collectors which feed

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Study of processes in cupola furnaces...

air to the tuyères and the burners, respectively. The tuyères are moreover arranged only in one row in connection with the considerably reduced amounts of coke and air used. In order to establish the optimum height of the burner assembly, twelve burners were mounted in the test-cupola in three rows, the first at a height of 770, the second at 1,070 and the third at 1,370 mm from the axis of tuyères. At the simultaneous combustion of gas and coke the regulation and distribution of the blast between tuyères and burners is very important. With the collectors (4, 5 in Fig. 1) which operate in combination with independent fans, the required constant gas-coke ratio in the cupola can be set and maintained. Complete burning of the gas outside the shaft is obtained by a special tunnel-antechamber for the discharge of the gas-air mixture from the burners. The most suitable burner for cupolas fired with mixed fuels is the double-circuit type, in which the gas and the air can be pre-mixed and the outlet cross section is such that the speed of the outflowing air-gas mixture is more than 40 - 50 m/sec. During smelting in the cupola furnace the parameters of gas and air consumption for tuyères and burners change constantly. The control panel (Fig. 4) has push buttons controlling the slidevalve mechanisms (16, Fig. 4), the push button for stopping the cupola operation in case of danger (17, Fig. 4), a button for au-

dible and one for light signals (18, 20, Fig. 4), a safety-release button (19, Fig. 4). In order to maintain a constant gas pressure before the burners and to ensure the combustion of gas at a given ratio to air, two jet-regulators from the Khar'kovskiy zavod Teploavtomat (Khar'kov Teploavtomat Plant) are mounted, one controlling the gas pressure (8, Fig. 4), the other the gas-air ratio (9, Fig. 4). The controlling pulse is given to the pressure regulator when the gas pressure before the burners attains 0.27 atmospheres. The change in pressure before the burners is compensated by a valve (operated by a СК-80-15 = SK-80-15 servo-motor), moving before the burners in the required direction to equalize the gas pressure. The gas-air ratio regulator receives pulses of pressure drops from a diaphragm which controls the gas and air consumption (differential type ДП3М (DPEM) pressure gauge). Air consumption of the tuyères and burners is controlled by an Э-610 (E-610), gas consumption by an Э-612 (E-612) device. In order to prevent gas-explosions, a ПК-100 (PK-100) safety valve, designed by the Mosgazproyekt, is mounted in the gas conduit; it is equipped with an electromagnet whose head is connected to the air-collector of the burners through a pulse pipe. When the air-pressure drops below a certain value, the gas supply is switched off automatically. When the gas pressure drops below 0.15 atm, the СПАС-1.5

Study of processes in cupola furnaces...

(SPDS-1.5) gas-pressure indicator (12, Fig. 4), starts operating and the gas-supply is stopped. The operation of all these devices is signaled by a flashlight (20) and a howler (13). The air-collectors are provided with valves to prevent their destruction in case of explosion. The smelting process, the quality of metal smelted in a mixed-fuel cupola and the composition of the combustion products were studied with various rows of burners (I, II, III) and also with different combinations, respectively: at the same time I-II, II-III, I-III and all three. The other conditions of the process (composition of the charge, for C4 24-44 (SCh 24-44)iron, firing conditions and temperature, etc.) were identical in all tests. It was found that by charging 100 kg coke and 30 m^3 gas into the furnace for 1 ton iron, 875,000 kcal heat was introduced, as against 992,000 kcal of heat used for the same amount of iron in furnaces fired by coke only. This can be explained by the fact that less heat is spent on slag formation due to the decrease in the amount of flux applied and to the improvement of heat transfer to the charge in the cupola furnaces, partly fired by gas. An analysis of the gas composition in coke-fired and coke-gas fired cupolas showed that the CO_2/CO ratio is higher in the latter type of furnaces. It was found that by mounting the burners higher in the furnace shaft the CO_2 content of furnace

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Study of processes in cupola furnaces...

gases increases while the CO content decreases. The hydrogen content also increases in furnaces with mixed fuels (it is 2 - 2.5 %, three times more than when firing with coke alone). The higher the burners are placed, the higher the hydrogen content. Figure 7 presents the temperature conditions of mixed-fuel cupolas and shows that they are 150 - 300°C higher than those in coke fired furnaces. At a level of 3 m from the tuyère the temperature of separating gases attains 950°C in the coke-gas furnace, (when row I of burners is operating), while the corresponding temperature for coke-fired furnaces is 650 - 700°C. Thus, the smelting of the metal charge begins at higher levels in the coke-gas fired furnace. As to the behavior of carbon, silicum and magnesium, no change is found in iron smelted in mixed-fuel cupolas, while the sulphur content decreases by 0.01 - 0.02 %. When the burners of the upper row are used, iron shows an increased tendency to form cementite and shrinkage cavities, while its fluidity seems to decrease. Moreover, iron produced in mixed-fuel furnaces has a higher hardness (by 10 - 15 Brinell grades) while the mechanical properties do not change. The lining of mixed-fuel furnaces requires more frequent repairs since it burns higher up. The coating consists of 35 % sand, 25 % refractory clay and 40 % waste of fireclay bricks. Especially the coating of gas-burner tunnels has to be

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Study of processes in cupola furnaces...

in perfect condition, because the regularity of the goemetrical form of the tunnel greatly affects the intensity of gas combustion. Coating with fireclay blocks was too expensive, a refractory mass is therefore used. The operation conditions of the mixed-fuel cupola are given in Table 6. The coke bed is 1,400 mm high. When the normal operation conditions are attained, further operation is controlled automatically. The experience of 14 months of operation has shown that the mixed-fuel cupola works satisfactorily with 10 % coke for 300 nm^3/hour gas at an air consumption of 5,000 nm^3/hour, producing 10 tons of iron per hour at a temperature of 1,430°C in the chute. The output of the mixed-fuel cupola is increased by 20 - 25 % as compared with coke-fired cupolas. There are 6 tables and 13 figures.

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S/128/61/000/001/004/009
A054/A133

Study of processes in cupola furnaces...

Figure 1:

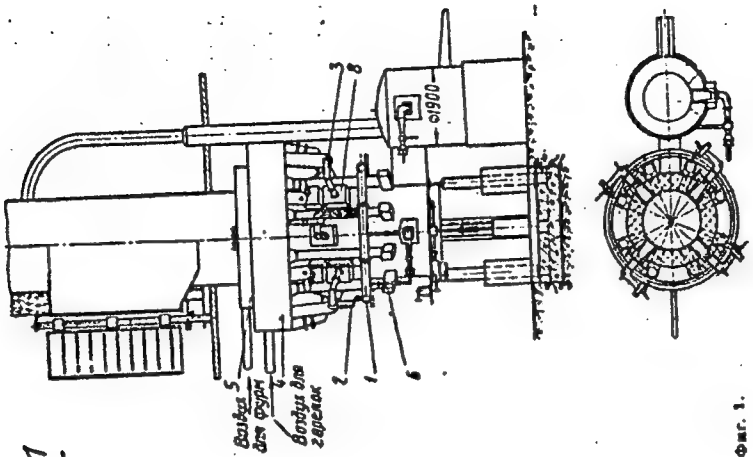

Fig. 1

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A054/A133

Study of processes in cupola furnaces...

Figure 1: (continued)

Mixed-fuel cupola furnace

1 - collector;
2 - stand pipe;
3 - burner;
4, 5 - air collectors;
6 - tuyère;
7 - tunnel;
8 - rectangular-section container.

Horizontal legend: 1 - Air for tuyères
2 - Air for burners

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Study of processes in cupola furnaces...

Fig. 4

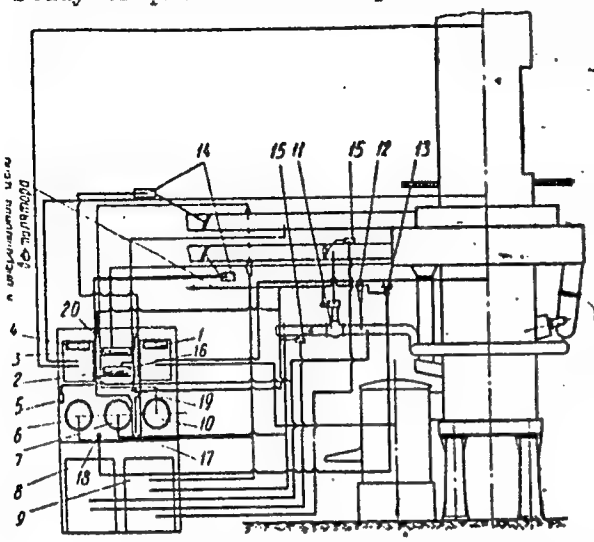

Figure 4:
Control devices and automatic system of the coke-gas fired furnace
1 - millivoltmeter; 2,3 - diaphragm pressure gauge; 4-millivoltmeter; 5 - (not given); 6, 10 - air consumption gauge; 7 - gasometer; 8, 9 - automatic jet regulators; 11 - safety valve; 12 - contacts indicating the gas pressure drop; 13 - howler; 14 - operating mechanism; 15 - servomotor, 16 - mechanism of slide valves; 17 - push button for stopping furnace operation; 18 - sound signal; 19 - safety switch off device; 20 - lamp.

Vertical legend: to the power line of fan

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Study of processes in cupola furnaces...

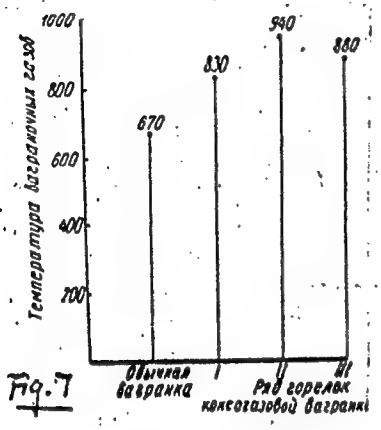

Fig. 7

Figure 7:

Temperature of furnace gases

Horizontal legend:
Conventional cupola, I-II-III row of burners in the coke-gas fired cupola

Vertical legend:
Temperature of furnace gases

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Study of processes in cupola furnaces...

Table 1: Technical characteristics of the test cupola

Designation	Specification
Internal diameter of the furnace shaft	1,300 mm
Number of tuyère rows	1
Number of tuyères in the row	8
Ratio of tuyère-section surface to the surface of shaft section	10 %
Number of burner rows	3
Total number of burners	12
Distance between bottom and tuyère axis	850 mm
Distance between the tuyère axis and the lowest row of burners	770 mm
Distance between the burner rows	300 mm
Distance between the upper edge of tuyères and the sill of charging door	3,935 mm
Forehearth-internal diameter	1,100 mm

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Study of processes in cupola furnaces...

Table 6: Operation conditions of cupola fired with coke and gas

Time from the beginning of furnace operation, min	Air in the tuyère		Air in the burner		Gas	
	Pressure mm water column	Consumption m^3/h	Pressure mm water column	Consumption m^3/h	Pressure mm water col	Consumption m^3/h
0 - 20	250-300	2,500	-	-	-	-
20 - 30	500-600	3,500	900-1,000	3,000	2,700	300
30 and more	700-800	5,000	950-1,050	3,000	2,700	300

The pressure should be raised until the pointer of the gage does not move from 0.

Card 12/12

KLETSKIN, G.I., kand. tekhn. nauk; SUKHARCHUK, Yu.S., kand. tekhn. nauk; BAGOMAVOV, B.P., inzh.; SOBOL', N.L., inzh.; D'YAKONOV, V.Ye., inzh.; RABINOVICH, V.D., inzh.

Melting cast iron in a coke-oven gas-fired cupola. Lit.proizv. no.12:1-4 D '65. (MIRA 18:12)

L 26089-66 EWA(l)/EWT(l)/ETC(f)/EWG(m) TT/AT

ACC NR: AP6013504 SOURCE CODE: UR/0120/66/000/002/0090/0092

48
46
B

AUTHOR: D'yakonov, V. P.

ORG: none

TITLE: A transistorized step-wave voltage generator 25

SOURCE: Pribory i tekhnika eksperimenta, no. 2, 1966, 90-92

TOPIC TAGS: transistorized oscillator, electronic circuit, transistor

ABSTRACT: Circuits are proposed for a step-wave voltage generator based on two transistors working in avalanche breakdown conditions. The basic version of the generator circuit is shown in the figure by the unbroken lines. Capacitor C_1 is charged through resistor R_c until the breakdown voltage for transistor T_1 is reached, when a voltage discharge takes place through the transistor to capacitor C_2 generating a voltage step on the second capacitor. Discharge of capacitor C_1 is completed when the voltage across the collector-emitter section of T_1 falls below the threshold voltage of this transistor. A series of discharges of this type causes a stepwise increase in the voltage across C_2 which eventually reaches the breakdown voltage of transistor T_2. Capacitor C_2 then discharges until the threshold voltage for T_2 is reached and the process repeats itself. This means that the voltage step-wave begins at the threshold value for T_2 instead of at zero, which reduces its amplitude. This may be avoid-

2

Card 1/3 UDC: 621.373.5

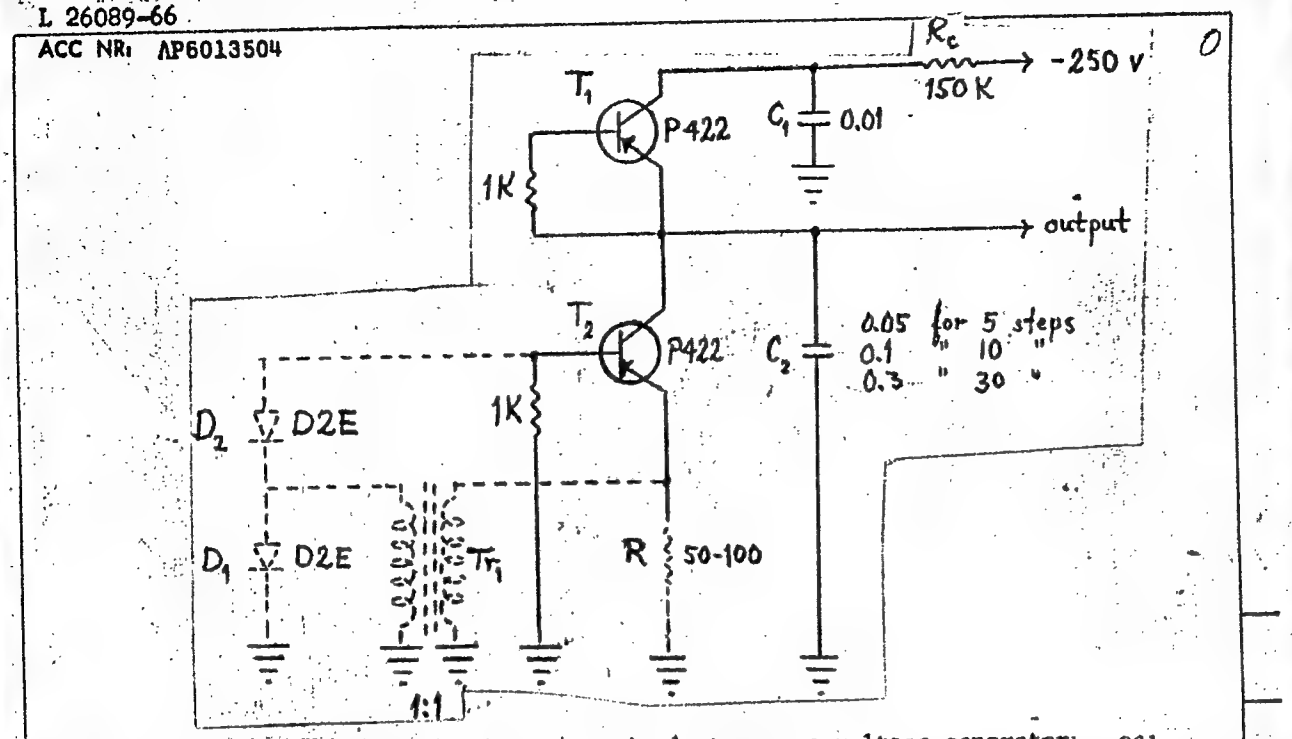

Fig. 1. Transistorized step-wave voltage generator.

ed by using the modified circuit shown by the dotted lines in the figure. The diodes isolate the negative pulse formed during discharge of C_2, and the transformer then feeds this pulse to the base circuit of T_2 thus triggering this transistor and instantaneously discharging the capacitor to zero voltage. Formulas are given for calculating the amplitude, duration and number of steps. It is shown that voltages with step durations of 2 μsec to 20 msec may be generated with amplitudes of up to 50 v and any number of steps. The author is grateful to G. A. Ali-Zade and Yu. S. Kengerlinskiy for discussion of this article and for valuable consultation. Orig. art. has: 3 figures, 1 table, 13 formulas. [14]

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D299/D303

AUTHOR: D'yakonov, Ye.G. (Moscow)

TITLE: On difference methods for solving boundary-value problems

PERIODICAL: Zhurnal vychislitel'noy matematiki i matematicheskoy fiziki, v. 2, no. 1, 1962, 57 - 79

TEXT: A difference scheme, called the fractional-step method, is considered. This method was developed by N.N. Yanenko (Ref. 5: Ob ekonomichnykh neyavnykh skhemakh (Metod drobnykh shagov). Dokl. AS SSSR, 1960, 134, no. 5, 1034-1036). The limits of applicability of the method are defined; a modified version of the method is proposed whereby its range is extended. The equation

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} \qquad (1.1)$$

is considered, on the cylinder

$Q_T = \bar{\Omega} \times [0 \leq t \leq T]$, $\bar{\Omega}$ {(x, y): 0 ≤ x ≤ 1, 0 ≤ y ≤ 1},

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with initial condition

$$u/_{t=0} = \varphi(x, y) \tag{1.2}$$

and boundary condition

$$u/_{s} = \psi(x, y, t), \quad (x, y) \in S. \tag{1.3}$$

Let h = 1/N be the step with respect to x and y; τ - the time step. Conditions (1.2) and (1.3) are approximated by

$$v_{ij}^{(0)} = \varphi_{ij}, \quad (i, j) \in \overline{\Omega}_h, \tag{1.2'}$$

$$v_{ij}^{(n)} = \psi_{ij}^{(n)}, \; v_{ij}^{(n+1)} = \psi_{ij}^{(n+1)}, \quad (i, j) \in S_h. \tag{1.3'}$$

The fractional-step method consists in setting up a system of equations involving the intermediate functions $v_{ij}^{(n+1/2)}$:

$$\begin{aligned} \frac{v_{ij}^{(n+1/2)} - v_{ij}^{(n)}}{\tau} &= \sigma \Delta_{x\bar{x}}^2 v_{ij}^{(n+1/2)} + (1-\sigma) \Delta_{x\bar{x}}^2 v_{ij}^{(n)}, \\ \frac{v_{ij}^{(n+1)} - v_{ij}^{(n+1/2)}}{\tau} &= \sigma \Delta_{y\bar{y}}^2 v_{ij}^{(n+1)} + (1-\sigma) \Delta_{y\bar{y}}^2 v_{ij}^{(n+1/2)}, \end{aligned} \tag{1.4}$$

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where

$$\Delta^2_{x\bar{x}} v_{ij} = \frac{v_{i+1,j} - 2v_{ij} + v_{i-1,j}}{h^2},$$

$$0 \leqslant \sigma \leqslant 1.$$

$$\Delta^2_{y\bar{y}} v_{ij} = \frac{v_{i,j+1} - 2v_{ij} + v_{i,j-1}}{h^2},$$

Eq. (1.4) is rewritten in the form

$$(E - \sigma\tau\Delta^2_{x\bar{x}})\, v_{ij}^{(n+1/2)} = (E + (1-\sigma)\,\tau\Delta^2_{x\bar{x}})\, v_{ij}^{(n)},$$

$$(i, j) \in \Omega_h, \qquad (1.5)$$

$$(E - \sigma\tau\Delta^2_{y\bar{y}})\, v_{ij}^{(n+1)} = (E + (1-\sigma)\,\tau\Delta^2_{y\bar{y}})\, v_{ij}^{(n+1/2)},$$

where E is the identity operator. System (1.5) is equivalent to

$$(E - \sigma\tau\Delta^2_{x\bar{x}})(E - \sigma\tau\Delta^2_{y\bar{y}})\, v_{ij}^{(n+1)} = \qquad (1.7)$$

$$= (E + (1-\sigma)\,\tau\Delta^2_{x\bar{x}})(E + (1-\sigma)\,\tau\Delta^2_{y\bar{y}})\, v_{ij}^{(n)} + \tau R_{ij}^{(n)},$$

where $R_{ij}^{(n)}$ is given by an expression; Eq. (1.7) was obtained by eliminating $v_{ij}^{(n+1/2)}$. If R_{ij} vanishes for all (ij), then (1.5) and

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(1.7) are equivalent. If however, $R_{ij} \neq 0$, it can be shown by an example that (1.7), (and hence (1.4) too), does not approximate Eq. (1.1). Thus, one arrives at the following Theorem 1.: For Eq. (1.1) with initial condition (1.2) and boundary condition $u|_S = 0$, the fractional-step method is absolutely stable and convergent, with the mean order of convergence $O(\tau) + O(h^2)$; in the case of a nonhomogeneous boundary condition (1.3), the method must not necessarily yield an approximation to Eq. (1.1). The modified method is then set forth. The equation

$$\frac{\partial u}{\partial t} = \sum_{s=1}^{p} L_s u + f \qquad (2.1)$$

is considered, with boundary conditions

$$\left(u, \frac{\partial u}{\partial \nu}, \ldots, \frac{\partial^{m-1} u}{\partial \nu^{m-1}}\right)_S = (0, 0, \ldots, 0) \qquad (2.2)$$

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and initial condition

$$u|_{t=0} = \varphi(x_1, x_2, \ldots, x_p). \qquad (2.3)$$

Here

$$L_s u = \sum_{\alpha=0}^{m} (-1)^{\alpha-1} \frac{\partial^\alpha}{\partial x_s^\alpha}\left(a_{s\alpha}(x_s)\frac{\partial^\alpha u}{\partial x_s^\alpha}\right),$$

The difference equation corresponding to this problem, is

$$\frac{v^{(n+s/p)} - v^{[n+(s-1)/p]}}{\tau} = \frac{1}{2}\left(L_s^h v^{(n+s/p)} + L_s^h v^{[n+(s-1)/p]}\right) \qquad (s = 1, 2, \ldots, p-1), \qquad (2.4)$$

$$\frac{v^{(n+1)} - v^{[n+(s-1)/p]}}{\tau} = \frac{1}{2}\left(L_p^h v^{(n+1)} + L_p^h v^{[n+(p-1)/p]}\right) + T^h f^{(n)}, \qquad (2.4)$$

where L_s is a sum of series terms, and $T^h f$ is a product of series terms. Further, the stability of system (2.4) is considered. One arrives at Theorem 2: The fractional-step method for the system (2.1), (2.2), (2.3) is (under certain conditions) absolutely stable and convergent with mean order of convergence $O(\tau^2) + O(h)$; if the equation has constant coefficients, the order of convergence is

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$O(\tau^2) + O(h^2)$. The equation

$$\frac{\partial u}{\partial t} = \sum_{s=1}^{p} \frac{\partial}{\partial x_s}\left(a_s(x_s, t)\frac{\partial u}{\partial x_s}\right) - \sum_{s=1}^{p} b_s(x_s, t)\,u + f, \qquad (3.1)$$

$a_s(x_s, t) > 0;\ b_s(x_s, t) \geqslant 0,$

is then considered, with boundary condition

$$u\big|_S = 0 \qquad (3.2)$$

and initial condition (2.3). The corresponding difference equations are set up. The conditions are ascertained for the stability of the difference system. Further, a modified version of the method is proposed which removes any limitations on the sign of b_s (in Eq. (3.1)). Eq. (2.1) is considered with conditions (2.2) and (2.3). The function u(x, t), is called the generalized solution of Eq.(2.1) provided it satisfies certain conditions. It is proved that the generalized solution exists and can be obtained as the limit of approximations which were obtained by the fractional-step method. The ba-

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sic mathematical apparatus used for this purpose involves difference- "energy inequalities". The proof proceeds by means of several theorems. There are 17 references: 12 Soviet-bloc and 5 non-Soviet-bloc. The 4 most recent references to the English-language publications read as follows: J. Douglas, H. Rachford, On the numerical solution of heat conduction problems in two and three space variables. Trans. Amer. Math. Soc., 1956, 82, no. 2, 421-439; J. Douglas T. Gallie, Variable time steps in the solution of the heat flow equation by a difference equation. Proc. Amer. Math. Soc., 1955, 6, no. 5, 787-793; M. Lees, Energy inequalities for the solution of differential equations. Trans. Amer. Math. Soc., 1960, 94, 58-73; M. Lees, Approximate solutions of parabolic equations. J. Soc. Industr. and Appl. Math., 1959, 7, 167-183.

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S/020/61/138/002/005/024
C111/C222

AUTHOR: D'yakonov, Ye.G.

TITLE: The method of variable directions in solving simultaneous equations of finite differences

PERIODICAL: Akademiya nauk SSSR. Doklady, v.138, no.2,1961,271-274

TEXT: The author proves the convergence of the method of variable directions (Ref. 2 : D.W. Peaceman, H.H. Rachford, J. Soc.Ind.Appl.Math., 3,28 (1955), Ref. 3 : J. Douglas, H.H. Rachford, Trans.Am.Math.Soc.,82, 421 (1956) ; Ref. 4 : G. Birkhoff, R. Varga, Trans.Am.Math.Soc.,92,13 (1959)) for the first boundary value problem in the rectangle for certain selfadjoint elliptic equations of higher than second order. For equations with separable variables the author gives an estimation of the velocity of convergence.
In the square D : $0 \leq x \leq 1$, $0 \leq y \leq 1$ the author considers the problem

$$Lu = \frac{\partial^2}{\partial x^2}\left(a(x)\frac{\partial^2 u}{\partial x^2}\right) + 2\frac{\partial^2}{\partial x\,\partial y}\left(b(x,y)\frac{\partial^2 u}{\partial x\,\partial y}\right) + \frac{\partial^2 u}{\partial y^2}\left(c(y)\frac{\partial^2 u}{\partial y^2}\right) -$$

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$$-\frac{\partial}{\partial x}\left(d(x)\frac{\partial u}{\partial x}\right)-\frac{\partial}{\partial y}\left(e(y)\frac{\partial u}{\partial y}\right)+f(x)u+g(y)u=h(x,y) \qquad (1)$$

$$u=0\ ;\quad \frac{\partial u}{\partial y}=0 \qquad (2)$$

$$a>0\ ,\ c>0\ ;\ b,d,e,f,g\geqslant 0\ ;\quad b^2-ac\leqslant 0\ ; \qquad (3)$$
$$a,b,c\in C^{(3)}\ ;\quad d,e,\in C^{(2)}\ ;\quad f,g\in C^{(1)}\ .$$

v_{ij} is defined as v(ih, jh) on the net D_h ; $x_i = ih$, $y_j = jh$; $h = 1/N$, $0\leqslant i\leqslant N$, $0\leqslant j\leqslant N$. It holds

$$u_{ij}=0 \quad \text{on } S_h\ . \qquad (4)$$

For exterior points of the square it holds $u_{ij} = 0$ and for $i,j\in D_h\setminus S_h$ for the determination of u_{ij} one obtains the system

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$$L_h u_{ij} = \Delta_{\overline{xx}} (a_i \Delta_{\overline{xx}} u_{ij}) + 2\Delta_{\overline{xy}} (b_{ij} \Delta_{xy} u_{ij}) + \Delta_{\overline{yy}} (c_j \Delta_{yy} u_{ij}) -$$

$$- \Delta_{\overline{x}} (d_i \Delta_x u_{ij}) - \Delta_{\overline{y}} (e_j \Delta_y u_{ij}) + f_i u_{ij} + g_j u_{ij} = h_{ij} \qquad (5)$$

where $\Delta_{\overline{x}} u_i = \frac{u_i - u_{i-1}}{h}$, $\Delta_x u_i = \frac{u_{i+1} - u_i}{h}$.

Let

$$L_x u_{ij} = \Delta_{\overline{xx}} (a_i \Delta_{\overline{xx}} u_{ij}) - \Delta_{\overline{x}} (d_i \Delta_x u_{ij}) + f_i u_{ij} \qquad (6)$$

$$L_y u_{ij} = \Delta_{\overline{yy}} (c_j \Delta_{yy} u_{ij}) - \Delta_{\overline{y}} (e_j \Delta_y u_{ij}) + g_j u_{ij} \qquad (7)$$

$$2L_{xy} u_{ij} = 2\Delta_{\overline{xy}} (b_{ij} \Delta_{xy} u_{ij}) \quad . \qquad (8)$$

Analogous to S.D. Conte (Ref. 5 : Pasif.J.Math. 7, no. 4, 1535 (1957)) the author defines the iteration process

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$$(L_x + \tau_n E)u_{ij}^{(n+1/2)} = h_{ij} - (L_y + 2L_{xy} - \tau_n E)u_{ij}^{(n)} \qquad (9)$$

$$(L_y + \tau_n E)u_{ij}^{(n+1)} = L_y u^{(n)} + \tau_n E u_{ij}^{(n+1/2)} \qquad (10)$$

where E - - unit operator, τ_n - - iteration parameter ; $u^{(n)}$, $u^{(n+1)}$ successive iterations, $u^{(n+1/2)}$ - - intermediate vector. By elimination of $u^{(n+1/2)}$ it follows :

$$\left[\tau_n^2 E + \tau_n(L_x + L_y) + L_x L_y\right] u^{(n+1)} = h + \left[\tau_n^2 E - 2\tau_n L_{xy} + L_x L_y\right] u^{(n)} \qquad (11)$$

and $$u - u^{(n)} = e^{(n)} \; ; \; Ae^{(n+1)} = Be^{(n)} \; , \qquad (12)$$

where $Ae^{(n+1)} = \left[\tau_n^2 E + \tau_n(L_x + L_y) + L_x L_y\right] e^{(n+1)}$; $Be^{(n)} =$

$\left[\tau_n^2 E - 2\tau_n L_{xy} + L_x L_y\right] e^{(n)}$.

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It holds $e^{(n)} = 0$ on S.

Lemma 1 : The operators A and B are symmetrical, where $(B\psi, \psi) > 0$ for $\|\psi\| > 0$, where $(\psi, \varphi) = \sum_{i=0}^{N} \sum_{j=0}^{N} \psi_{ij} \varphi_{ij} h^2$.

Theorem 1 : For a fixed $\tau_n \geqslant 0$ the iteration process (9), (10) converges in the metric $\|\psi\|_B^2 = (B\psi, \psi)$.

Theorem 2 : If $b \equiv 0$, then for a suitable choice of $\{\tau_n\}$, $\asymp \ln h \ln \varepsilon$ iterations according to the method of variable directions suffice for the determination of the solution of (4), (5). The number of arithmetic operations is $\asymp h^{-2} \ln h \ln \varepsilon$.

There are 2 Soviet-bloc and 5 non-Soviet-bloc references. The four most recent references to English-language publications read as follows :

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